

WHAT IS CLAIMED IS:

1. An optical disk recording apparatus which records information on a recordable optical disk employing a constant  
5 angular velocity recording method and generates a write reference clock signal used for obtaining recording timing in a data-recording operation on the optical disk, the apparatus comprising:

a first comparator configured to compare phases and  
10 frequencies between a frequency-divided signal of a predetermined reference clock signal input from outside and a frequency-divided signal of the write reference clock signal, and to output a first error signal representing comparison results;

15 a second comparator configured to compare phases and frequencies between a first signal recorded beforehand on the optical disk and the frequency-divided signal of the write reference clock signal, and to output a second error signal representing comparison results and a first frequency  
20 differential signal representing a frequency difference;

a third comparator configured to compare phases and frequencies between one of the first signal and a second signal recorded beforehand on the optical disk and the frequency-divided signal of the write reference clock signal,  
25 and to output a third error signal representing comparison results and a second frequency differential signal

representing a frequency difference;

a selection circuit configured to select any one of the first through third error signals output from the first through third comparators, respectively, and to exclusively  
5 output the signal selected;

a control voltage generator configured to generate a control voltage from the signal output from the selection circuit, and to output the control voltage;

a voltage control oscillator configured to generate and  
10 output the write reference clock signal having a frequency corresponding to the control voltage input from the control voltage generator; and

a control circuit configured to control operations of the selection circuit according to the first and second  
15 frequency differential signals.

2. The apparatus according to Claim 1, wherein said control circuit causes said selection circuit to select and exclusively output said first error signal as the write  
20 reference clock signal during a predetermined time period  $t_0$  as an initial action of a start-up operation of the apparatus.

3. The apparatus according to Claim 2, wherein said control circuit causes said selection circuit to select and  
25 exclusively output said second error signal as the write reference clock signal after a lapse of the predetermined

time period  $t_0$ .

4. The apparatus according to Claim 1, wherein said control circuit causes said selection circuit to select and  
5 exclusively output said third error signal as the write reference clock signal when a difference in frequency indicated by the first frequency differential signal output from said second comparator is smaller than or equal to a predetermined value  $\alpha$ .

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5. The apparatus according to Claim 4, wherein said control circuit causes said selection circuit to select and  
exclusively output said second error signal as the write  
reference clock signal when a difference in frequency  
15 indicated by the second frequency differential signal output from said third comparator is greater than or equal to a predetermined value  $\beta$  which is smaller than said value  $\alpha$ .

6. The apparatus according to Claim 2, wherein said  
20 control circuit detects tracking status during the recording process on the optical disk, and when an off-tracking is detected after a lapse of the predetermined time period  $t_0$  from the start-up operation, said control circuit causes said selection circuit to stop outputting the first, second, or  
25 third error signal during a predetermined time period  $t_1$ .

7. The apparatus according to Claim 6, wherein said control circuit causes said selection circuit to select and exclusively output the first error signal as the write reference clock signal after a lapse of said predetermined  
5 time period t1.

8. The apparatus according to Claim 6, wherein said control circuit causes said selection circuit to select and exclusively output said second error signal when tracking is  
10 established within said predetermined time period t1.

9. The apparatus according to Claim 1, wherein the first signal is a wobble signal.

15 10. The apparatus according to Claim 1, wherein the second signal is a land pre-pit signal.

11. The apparatus according to Claim 1, wherein the one of the first and second signals is determined according  
20 to a type of the optical disk.

12. An optical disk recording apparatus which records information on a recordable optical disk employing constant angular velocity recording method and generates a write  
25 reference clock signal used for obtaining recording timing in a data-recording operation on the optical disk, the apparatus

comprising:

first comparing means for comparing phases and frequencies between a frequency-divided signal of a predetermined reference clock signal input from outside and a frequency-divided signal of the write reference clock signal, and for outputting a first error signal representing comparison results;

second comparing means for comparing phases and frequencies between a first signal recorded beforehand on the optical disk and the frequency-divided signal of the write reference clock signal, and for outputting a second error signal representing comparison results and a first frequency differential signal representing a frequency difference;

third comparing means for comparing phases and frequencies between one of the first signal and a second signal recorded beforehand on the optical disk and the frequency-divided signal of the write reference clock signal, and for outputting a third error signal representing comparison results and a second frequency differential signal representing a frequency difference;

selection means for selecting any one of the first through third error signals output from the first through third comparing means, respectively, and for exclusively outputting the signal selected;

control voltage generating means for generating a control voltage from the signal output from the selecting

means, and for outputting the control voltage;

voltage control oscillating means for generating and outputting the write reference clock signal having a frequency corresponding to the control voltage input from the control voltage generating means; and

control means for controlling operations of the selecting means according to the first and second frequency differential signals.

13. The apparatus according to Claim 12, wherein said control means causes said selection means to select and exclusively output said first error signal as the write reference clock signal during a predetermined time period  $t_0$  as an initial action of a start-up operation of the apparatus.

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14. The apparatus according to Claim 13, wherein said control means causes said selection means to select and exclusively output said second error signal as the write reference clock signal after a lapse of the predetermined time period  $t_0$ .

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15. The apparatus according to Claim 12, wherein said control means causes said selection means to select and exclusively output said third error signal as the write reference clock signal when a difference in frequency indicated by the first frequency differential signal output

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from said second comparing means is smaller than or equal to a predetermined value  $\alpha$ .

16. The apparatus according to Claim 15, wherein said  
5 control means causes said selection means to select and exclusively output said second error signal as the write reference clock signal when a difference in frequency indicated by the second frequency differential signal output from said third comparing means is greater than or equal to a  
10 predetermined value  $\beta$  which is smaller than said value  $\alpha$ .

17. The apparatus according to Claim 13, wherein said control means detects tracking status during the recording process on the optical disk, and when an off-tracking is  
15 detected after a lapse of the predetermined time period  $t_0$  from the start-up operation, said control means causes said selection means to stop outputting the first, second, or third error signal during a predetermined time period  $t_1$ .

20 18. The apparatus according to Claim 17, wherein said control means causes said selection means to select and exclusively output the first error signal as the write reference clock signal after a lapse of said predetermined time period  $t_1$ .

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19. The apparatus according to Claim 17, wherein said

control means causes said selection means to select and exclusively output said second error signal when tracking is established within said predetermined time period t1.

5           20.   The apparatus according to Claim 12, wherein the first signal is a wobble signal.

          21.   The apparatus according to Claim 12, wherein the second signal is a land pre-pit signal.

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          22.   The apparatus according to Claim 12, wherein the one of the first and second signals is determined according to a type of the optical disk.

15           23.   A method of recording information on a recordable optical disk employing a constant angular velocity recording method and generating a write reference clock signal used for obtaining recording timing in a data-recording operation on the optical disk, the method comprising the steps of:

20           first comparing phases and frequencies between a frequency-divided signal of a predetermined reference clock signal input from outside and a frequency-divided signal of the write reference clock signal to output a first error signal representing comparison results;

25           second comparing phases and frequencies between a first signal recorded beforehand on the optical disk and the



frequency-divided signal of the write reference clock signal to output a second error signal representing comparison results and a first frequency differential signal representing a frequency difference;

5        third comparing phases and frequencies between one of the first signal and a second signal recorded beforehand on the optical disk and the frequency-divided signal of the write reference clock signal to output a third error signal representing comparison results and a second frequency  
10 differential signal representing a frequency difference;

selecting any one of the first through third error signals output from the first through third comparing steps, respectively;

generating a control voltage from the signal selected  
15 in the selecting step;

generating the write reference clock signal having a frequency corresponding to the control voltage input in the controlling step; and

controlling operations of the selecting step according  
20 to the first and second frequency differential signals.

24. The method according to Claim 23, wherein said controlling step causes said selecting step to select and exclusively output said first error signal as the write  
25 reference clock signal during a predetermined time period  $t_0$  as an initial action of a start-up operation of the method.

25. The method according to Claim 24, wherein said  
controlling step causes said selecting step to select and  
exclusively output said second error signal as the write  
5 reference clock signal after a lapse of the predetermined  
time period  $t_0$ .

26. The method according to Claim 23, wherein said  
controlling step causes said selecting step to select and  
10 exclusively output said third error signal as the write  
reference clock signal when a difference in frequency  
indicated by the first frequency differential signal output  
from said second comparing step is smaller than or equal to a  
predetermined value  $\alpha$ .

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27. The method according to Claim 26, wherein said  
controlling step causes said selecting step to select and  
exclusively output said second error signal as the write  
reference clock signal when a difference in frequency  
20 indicated by the second frequency differential signal output  
from said third comparing step is greater than or equal to a  
predetermined value  $\beta$  which is smaller than said value  $\alpha$ .

28. The method according to Claim 24, wherein said  
25 controlling step detects tracking status during the recording  
process on the optical disk, and when an off-tracking is

detected after a lapse of the predetermined time period t0 from the start-up operation, said controlling step causes said selecting step to stop outputting the first, second, or third error signal during a predetermined time period t1.

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29. The method according to Claim 28, wherein said controlling step causes said selecting step to select and exclusively output the first error signal as the write reference clock signal after a lapse of said predetermined  
10 time period t1.

30. The method according to Claim 29, wherein said controlling step causes said selecting step to select and exclusively output said second error signal when tracking is  
15 established within said predetermined time period t1.

31. The method according to Claim 23, wherein the first signal is a wobble signal.

20 32. The method according to Claim 23, wherein the second signal is a land pre-pit signal.

33. The method according to Claim 23, wherein the one of the first and second signals is determined according to a  
25 type of the optical disk.